712CD

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Report Documentation Page

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Automatic Identification Technology for Arms Room Management

LTC John B. Willis
US Military Academy
Department of Systems Engineering

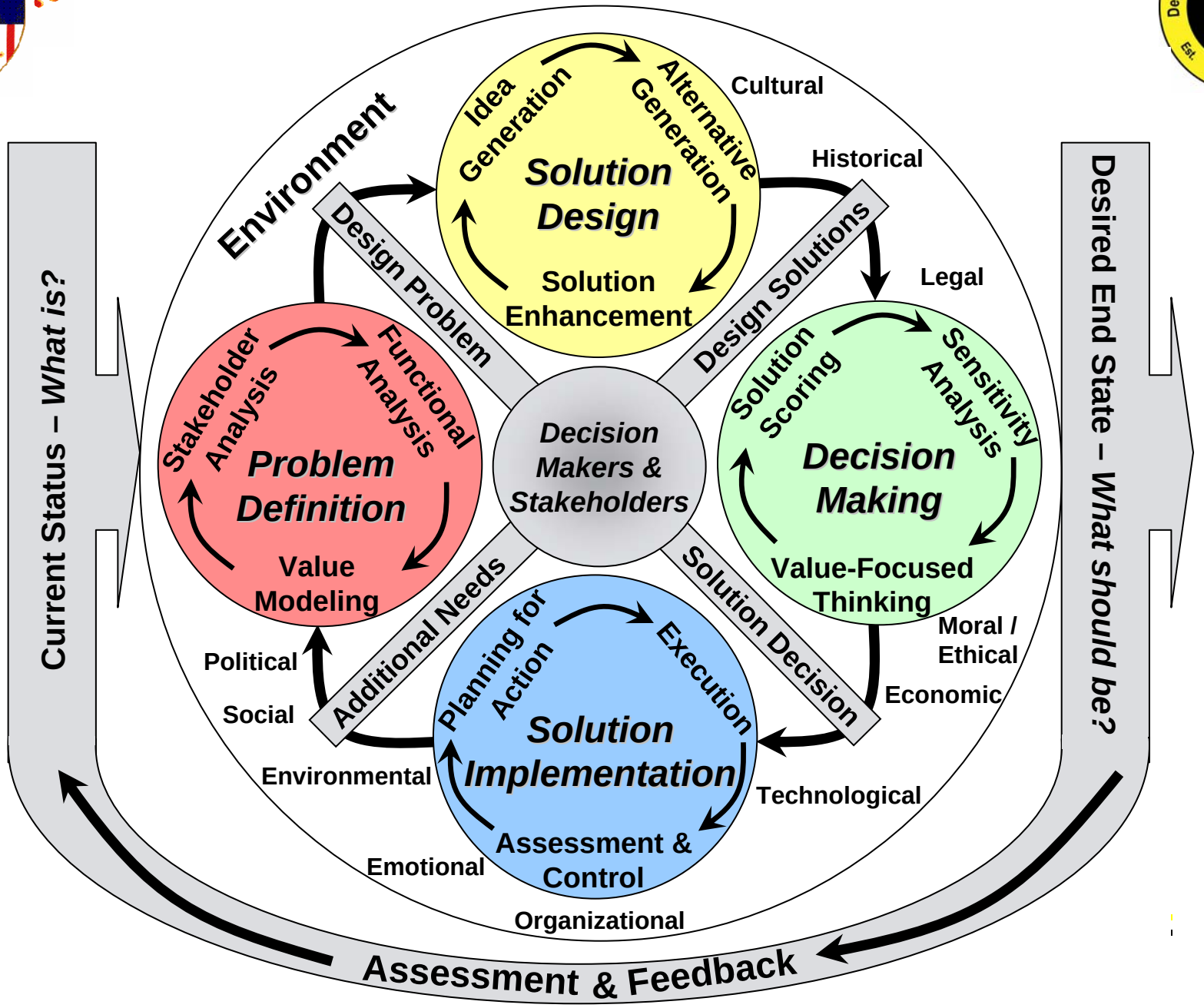
Agenda

- Background
- Approach
- Analysis and Results
- Path Forward

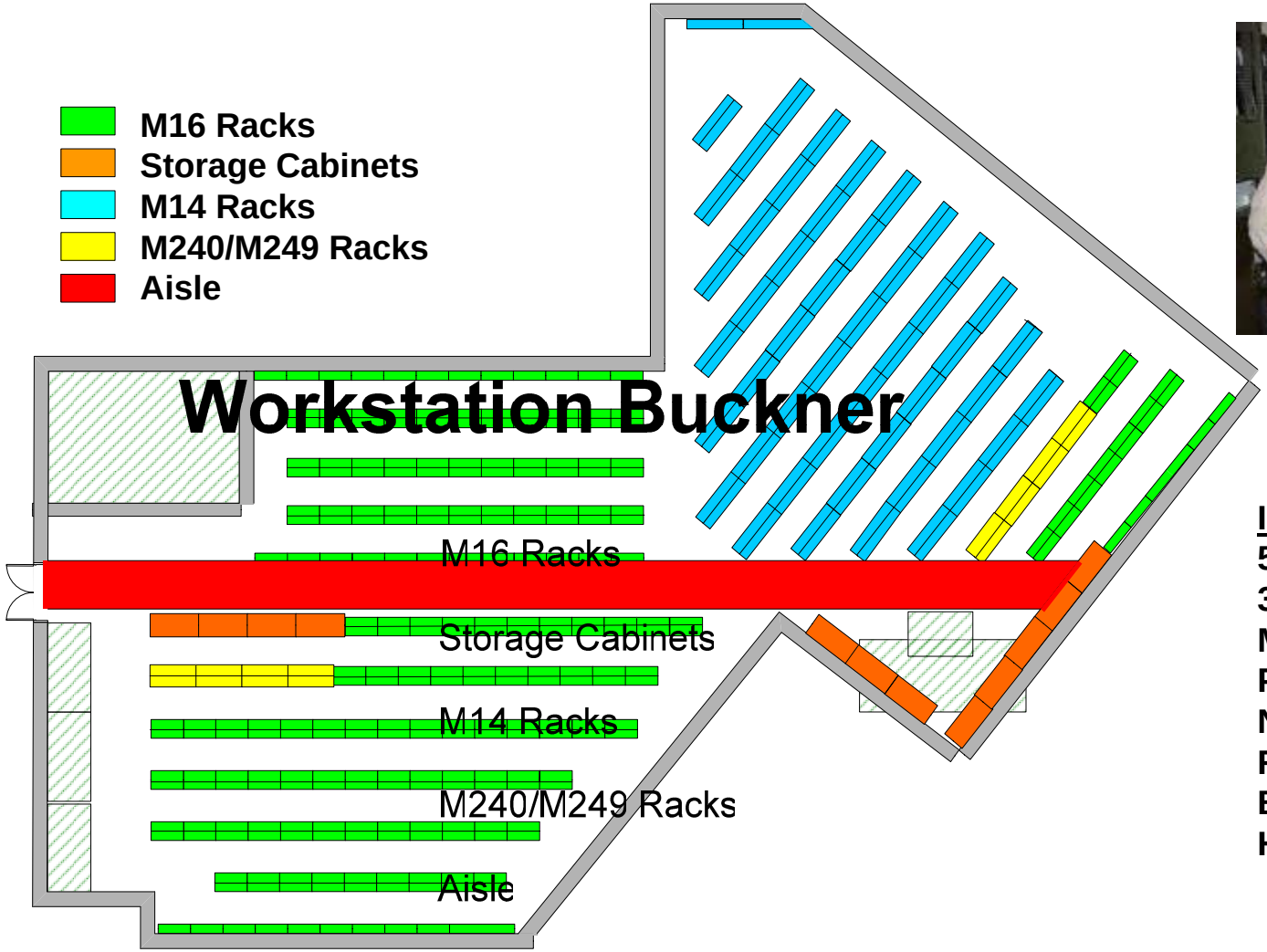
Problem Background

- **USMA Arms Room contains ~12,000 sensitive items and requires a system is to provide:**
  - **Security – IAW AR 190-11 and 190-13.**
  - **Accountability – employ AIT technology.**
  - **Efficiency – rapid draw and turn-in process.**
  - **Accessibility – allow open access for cadets.**

The Systems Decision Process (SDP)



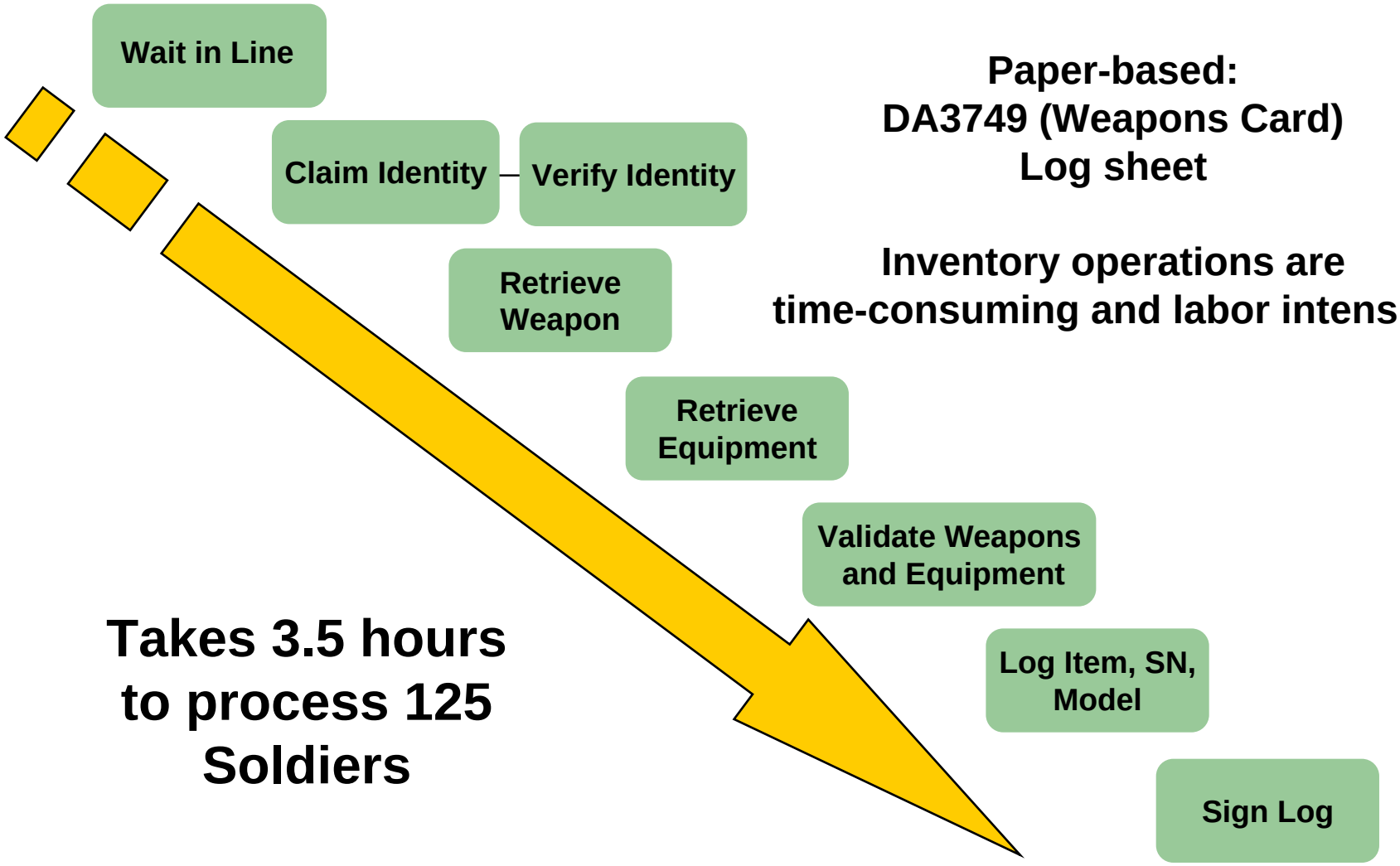
USMA Arms Room Layout



Inventory includes:

- 5,300 M16A2 Rifles
- 3,600 M14 Rifles
- Machine Guns
- Pistols
- Night Vision Devices
- Radios
- Bayonets
- Historical Weapons

Current Arms Room Process

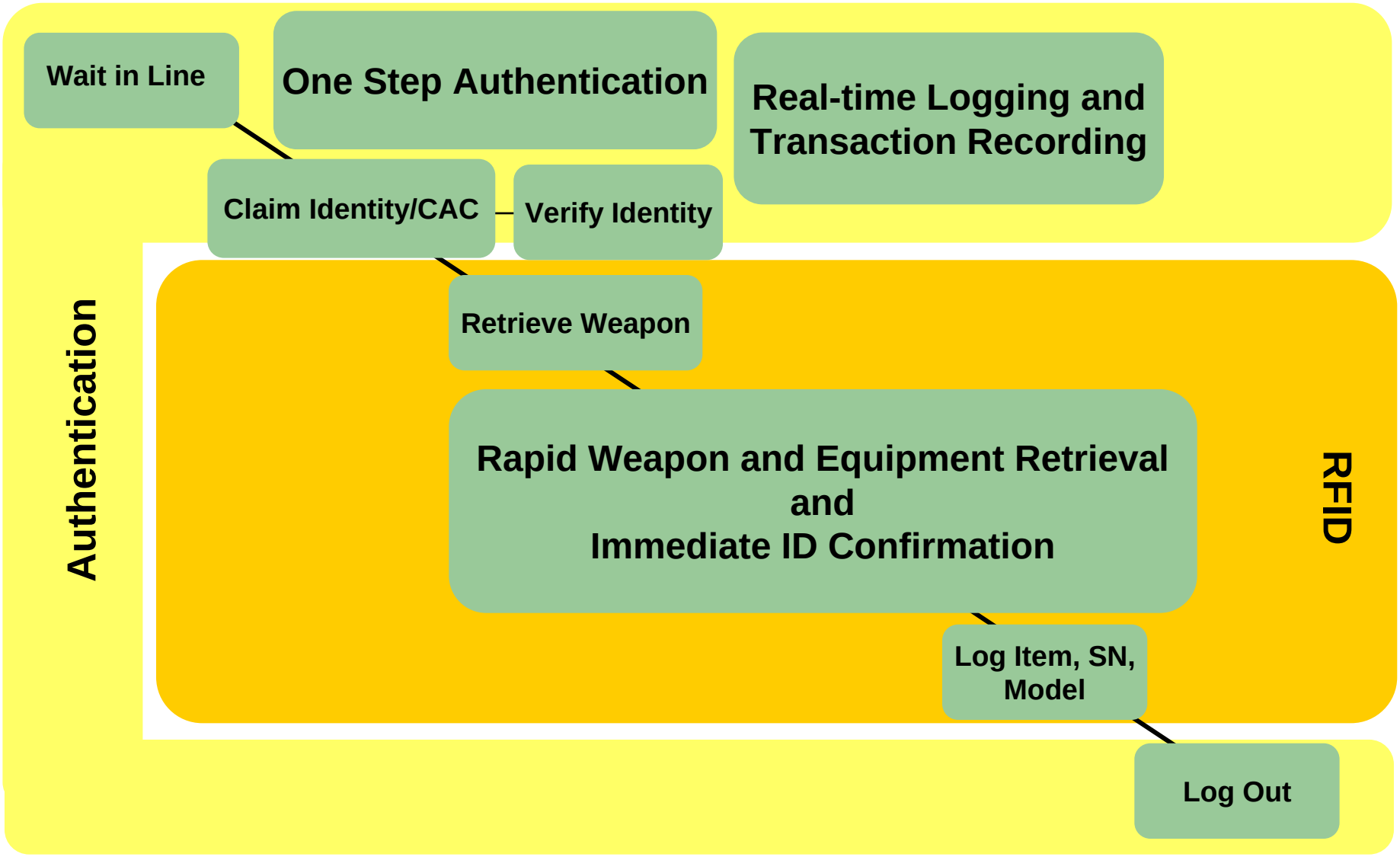


Paper-based:
DA3749 (Weapons Card)
Log sheet

Inventory operations are time-consuming and labor intensive

Takes 3.5 hours to process 125 Soldiers

AIT-Based Arms Room



Automatic Identification Technology - Definition

"AIT is a suite of technologies that enable the automatic capture of source data, thereby enhancing the ability to identify, track, document and control deploying and redeploying forces, equipment, personnel and sustainment cargo."

Logistics AIT CONOPS – Nov 1997

The NAVAIR Team as an AIT Resource

SPECIFIC AIT KNOWLEDGE

- ✓ UID/UII Requirements
- ✓ 1 and 2D Bar Code Scanners
- ✓ CCD and Laser Scanners
- ✓ Contact Memory Devices
- ✓ RFID (passive/active) Systems
- ✓ Interrogator's - Fixed and Portable
- ✓ Wireless Networks

AIT APPLICATION EXPERIENCE

- ✓ Item Visibility Tracking
- ✓ Warehouse Asset Inventory
- ✓ Item Maintenance Records
- ✓ AIT System Integration
- ✓ Weapons Management
- ✓ Supply Management

EXPERIENCED TEAM

- ✓ AIT Specialists
- ✓ Software Programmers
- ✓ System Analysts
- ✓ Operators/Installers
- ✓ Trainers

DoD Sponsors ….

- ➢ Navy: NAVSUP, NAVSEA
- ➢ Army: LIA
- ➢ DoD Logistics AIT Office
- ➢ MARCORSYSCOM
- ➢ OSD AT&L

Other Government Clients …

- ➢ Department of Homeland Security
- ➢ Transportation Security Administration
- ➢ Customs and Border Protection
- ➢ White House Communications Agency

NAVAIR AIT Team Experience

Support for Department of Defense

- Navy's Fleet Readiness Center Support Equipment Facility Business Process Analysis
- U.S. Army Armory Sensitive Item Marking (SIM) Asset Management System
- US Navy Shipboard RFID Compatibility Study
- OSD AT&L Analysis of Alternatives to DPAS
- US Army LIA Evaluation of Micro-Electrical-Mechanical Sensors (MEMS) for Military Medical Application

Support to other Federal Agencies

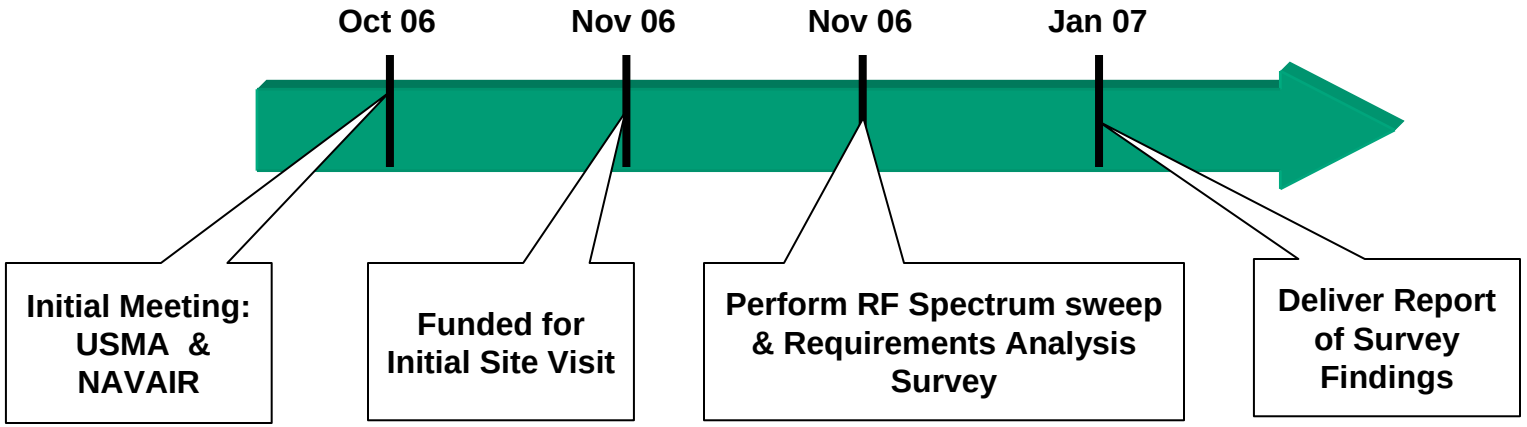
- Transportation Security Administration: Nationwide Asset Management System Support – Sunflower Asset Management System
- Customs and Border Protection: RFID Asset Tracking System for Weapons and Body Armor
- Federal Flight Deck Officers Program: RFID System for Weapons and Credential Management
- National Explosive Detection K-9 Program: Training Asset Tracking System

Project Overview

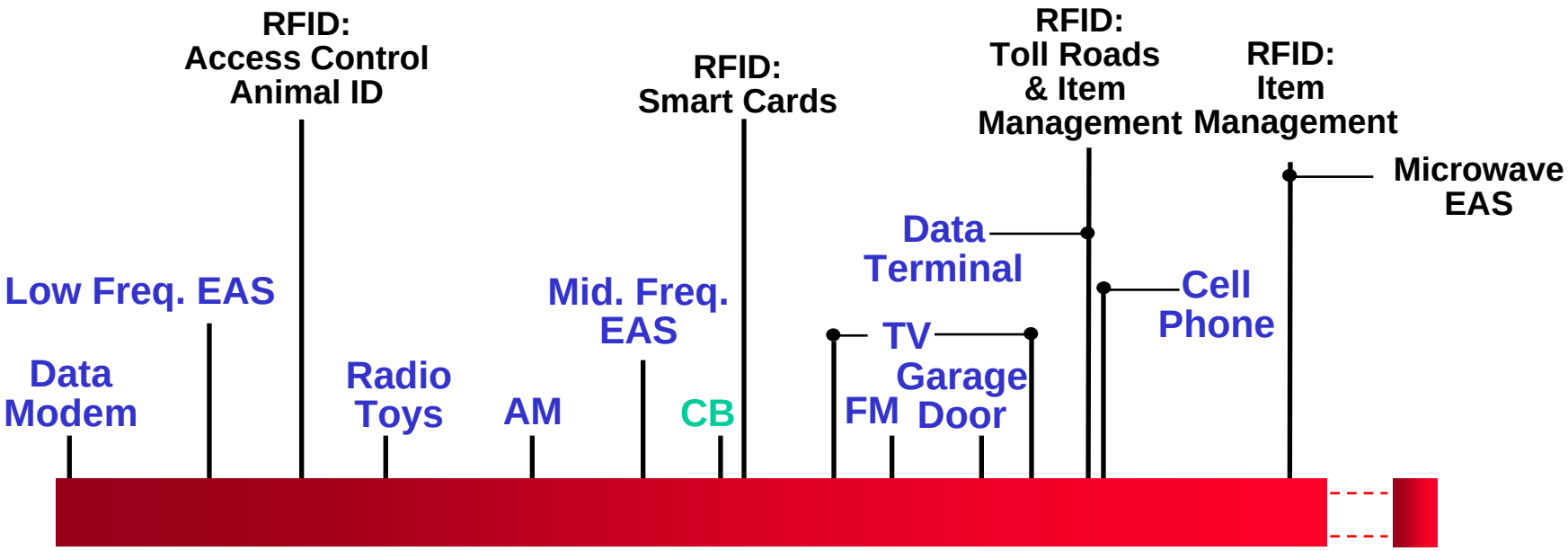
- **Define Existing Operational Requirements**
  - **Requirements Analysis Completed.**
  - **Results Documented.**
- **Develop/Test Automated Armory Asset Management System (A^3MS) Design**
  - **Develop approaches to integrate RFID and UID technologies.**
  - **Test and Evaluation Design Approach.**
  - **Establish Detailed Design Plan.**
- **Equipment Procurement, Installation and System Implementation**
  - **Future Effort.**

Project Timeline

- NAVAIR Team initially met with USMA October 06.
- Discussed AIT technology solutions for arms room weapons and equipment tracking.
  - Documented high level requirements; reviewed arms room layout at USMA.
  - Earned concurrence from USMA for site survey/business process analysis .
  - Perform RF spectrum analysis used to identify any potential interference issues.
  - Resulting report used as checkpoint for proceeding .



Thousands of Products use the RF Spectrum



Why Now?

- **Technology Maturity**
  - **Costs dropping, reliability rising**
- **Realization of ROI for AIT and Total Asset Visibility (TAV)**
  - **Straight forward application with clear benefits**
- **DoD RFID Policy**
  - **The giant has been awakened…**

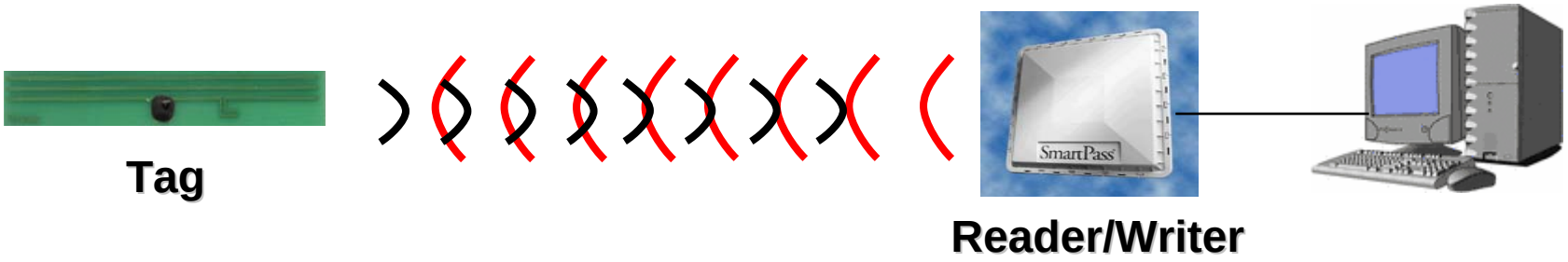
Characteristics of Active and Passive RFID Tags

Characteristic	Passive Tags	Active Tags
Communication power supply	External – From reader	Internal battery
Read range	Up to 15 feet*	Up to 250 feet**
Write range	0.5x to 1.5x as read range	1X read range
Storage capacity	Relatively less	Relatively more
Susceptibility to interference	Higher	Lower
Tag cost	$0.35 to several dollars	Typically Over $20
Life of tag	Up to 20 years	Roughly 5 to 10 years

* Metal impedes read range and can reduce it substantially.

** Some read ranges extend well beyond 250 feet in ideal conditions.

Passive RFID Technology



- RF energy emitted from antenna is used to power tag circuit.
- Tags use this energy to update data, emit (backscatter) signal at a fraction of the received power.
- These tags can carry single unique ID or multiple character length data fields.
- Range/performance is tied directly to frequency and power output.

Benefits of RFID

- **Automatic identification of weapons and equipment.**
- **Rapid authentication of Soldiers and armorers.**
- **Information-rich environment, powered by RFID association.**
- **Captures, stores, and correlates detailed information about all system transactions**
  - **Draw and turn-in date/time and personnel.**
  - **Maintenance / cleaning.**
  - **Inventory requirements.**

Benefits of an Integrated A³MS

- **Benefits of Deploying RFID Technology**
  - Automate the Inventory Process and Improve Inventory Accuracy
  - Update and Maintain a Real-Time Inventory
  - Time and Cost Savings for the Issue/Return Process
- **Benefits of Deploying UID Technology**
  - Unique Serialized Identification on each and every Asset
  - Permanent Mark for the Life of the Asset
  - Provides Asset Record for DoD Registry
- **Benefits of an Integrated RFID/UID System**
  - Meets DoD UID Requirements
  - Verify and Validate the Inventory to Ensure Clean Audit

RFID Tag Installation

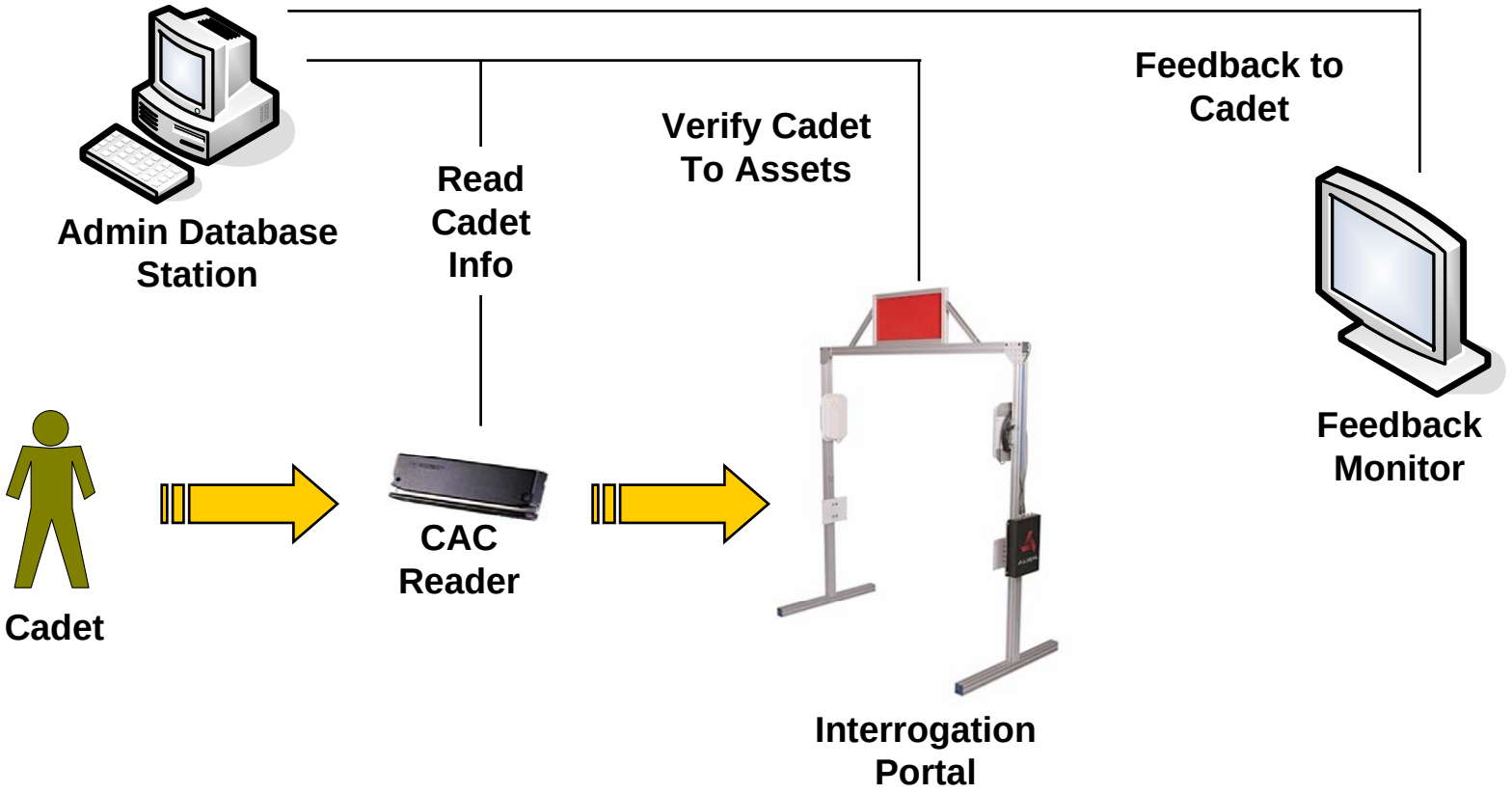
- **Attached to the receiver near S/N (accountable portion.)**
- **Input from arms room manager is critical.**
- **Few lost tags with proper mounting.**

UID Marking

Laser Etched Permanent Mark

Removable Label Designed
For Reading Weapon in Gun Rack

Example Portal Configuration



Handheld Interrogator

- **Low cost COTS product.**
- **Easy to navigate user interface using standard Microsoft Windows color schemes and controls.**
- **Intel XScale 600 MHz processor, 256 MB ram using Windows Pocket PC operating system for ease of use.**

AIT Initial Concept Analysis & Results

- **Business Processes addressed:**
  - **Initial issue/receipt of weapons to cadets using CAC card or other AIT media**
  - **Inventory Control process to increase accuracy and timeliness**
  - **Evaluate UID 2D data matrix barcode placement and size**
  - **Evaluate optimal marking processes/tag selection to fit weapon type**

- **Business Process Flows captured:**
  - **Cadet Issue and Return – via RFID portal, CAC identification of Cadet and RFID on asset supporting high traffic volume with accountability**
  - **Routine operations using handheld to perform low volume functions**
  - **Data captured automatically, hand receipt DA 2062 system-generated**
  - **System-generated reports (Issued/Returned, Asset Location, Inventory Discrepancy)**

- **Legacy inventory management systems interface if needed**

- **Observed "clean" RF spectrum during analysis sweep (902 - 928 MHz)**

Path Forward

- **Final design planning**
- **Procurement and installation**
- **Training**
- **Support**

Questions

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